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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 120903

Application Number: 09/623,474
Filing Date: September 13, 2000
Appellant(s): UENISHI ET AL.

Norman F. Oblon and Roland Martin
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed October 20, 2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 8 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

A substantially correct copy of appealed claims 1, 3-8 and 11-17 appears on pages 8-10 of the Appendix to the appellant's brief. The minor errors are as follows:

In claim 1, last line, correct "τ/τs" to --τp/τs--.

In claim 8, line 2, correct "L/(m2 hr kPa)" to --L/(m^2 X hr X kPa)--.

(9) Prior Art of Record

EP 0 740 952 A1 Applicant: Mitsubishi Acetate Co., Ltd. Inventors: Kunio Misoo, Kohji Ohbori, and Noritaka Shibata

JP 3-169330 Applicant: Mitsubishi Rayon Co., Ltd. Inventors: Kamo Jun, Uchida Makoto, and Hirai Takayuki

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3-8 and 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0740952 either individually, or in view of JP 3-169330 (Abstract). This rejection is set forth in prior Office Action, Paper Nos. 7 and 10.

EP 074952 A1 is directed to a multilayered membrane to meet both requirements of high water permeability and high separation capability (EP 074952 A1, pages 2-3, bridging paragraph). The multilayered microporous membrane comprises a b-layer to provide a function of reinforcing mechanical strength, and a-layer to provide a separation function (page 3, lines 3-5). The membrane may have a two-layered structure with b-layer as inner or outer layer, or a three-layered structure with b-layer on both surfaces of a-layer (page 3, lines 39-41). For a-layer, the size of micropores is in the range of 0.1-0.8 mm, preferably 0.3-0.5 mm, and its thickness is in the range of 0.5-

20 mm. For b-layer, the size of micropores in is in the range of 0.2-1 mm, preferably 0.4-0.5 mm, and its thickness is greater than 2/3 of the total membrane thickness (page 3, lines 49-55). Figs. 1-4 show that the microfibrils are divided into groups of a plurality of pieces that are bundled together and that the micropores are elliptic.

For claim 1, EP 074952 A1 teaches all the structural elements of the instantly claimed invention. Although the only example for a three-layered membrane (Ex.3) shows a low porosity of only 64%, it is noted that in Table 1, 9 out of 10 examples are two-layered membranes, with the b-layer thickness in the range of 50-78 mm, and overall membrane porosity in the range of 60-76%, and one of ordinary skill in the art would find that the calculated b-layer thickness (assuming a symmetrical structure) of Ex.3 is only of 28 mm, which is clearly much less than the typical thickness of b-layer (as shown in the two-layered membrane) and does not appear to be a representative thickness. As such, when considering the teachings of EP 074952 A1 as a whole, and in view of the fact that EP 074952 A1 teaches essentially the same process (melt extrusion, followed by stretching and annealing, see Examples 1-10) to make the multilayered membrane which also has essentially the same three-dimensional net structure, the plurality of the micropores which comprises stacked lamella and micro fibrils with desired length, and layer thickness, etc., as set forth above, it is believed the teachings of EP 074952 A1 clearly encompass the high porosity element of the three-layered structure of the instantly claimed invention, i.e., the high porosity is an obvious optimization to one of ordinary skill in the art of multilayered composite membrane, motivated by the desire to form a three-layered membrane having both high water

permeability and high separation by forming a thin a-layer, as separation layer, which is supported on both surfaces with highly porous b-layers, as reinforcing layers, as taught by EP 074952 A1. As to a suitable ratio of isothermal crystallization time $\tau p/\tau s$, since the method of making the membrane is essentially the same, and also that the suitable micropore size and structures of the instantly claimed invention are disclosed by EP 074952 A1, in the absence of unexpected results, a suitable ratio of the isothermal crystallization time between the membrane layers are believed to be either inherent physical properties of the polyolefins required by the membrane manufacturing process (e.g., annealing is typically carried out isothermally, and note also that EP 074952 A1 does teach at page 4, lines 48-52, that selecting a proper relation of melt index, which is a measure of the mobility of the polymer chains and inherently effects chain mobility dependent isothermal crystallization time, of MIb>MIa is important for forming proper micropores in each layer), or an obvious optimization to one of ordinary skill in the art, motivated by the desire to form suitable size of the lamella crystals and hence the proper size of the micropores in each layer. Additionally, the Examiner has previously pointed out that this is a product-by-process element, and Applicant must show that the resultant article is patentably distinct from those taught by the reference (see Paper No. 7, page 4).

For claim 3 and 4, EP 074952 A1 teaches that the mean distance between each microfibril bundle in the a-layer is in the range of 0.1 - 0.8 μm (page 3, lines 49-50), and in the b-layer is in the range of 0.2 - 1 μm (page 4, lines 4-5). The mean distance between each knotted portion of stacked lamella, i.e., mean microfibril length, of b-layer

is preferably in the range of 0.4 – 4.0 μm (page 4, lines 10-11). Further, the mean microfibril length of a-layer appears in the range of 0.2 – 0.77 μm (page 13, Table 1).

For claims 5, 6 and 17, EP 074952 A1 teaches that the a-layer has a thickness in the range of 0.5 – 20 μm (page 3, line 54), and the total membrane thickness is in the range of 5 to 500 μm (page 3, line 37).

For claim 7, EP 074952 A1 teaches that the membrane is coated by 3 to 30% by weight of hydrophilic polymer (page 3, line 10).

For claim 8, EP 074952 A1 teaches that depending on the size of the particles to be separated, the flux value can be up to and not less than 5 liter/(m^2 X hr X mmHg), i.e., greater than 37.5 L/(m^2 X hr X KPa) (page 4, lines 24-33), which is clearly greater than the amount of 25 L/(m^2 X hr X KPa) of Claim 8. As such, a suitable initial high water permeability is believed to be either inherently disclosed by the permanent hydrophilic property of the membrane, or an obvious optimization to one of ordinary skill in the art of high flux water filtration membrane, motivated by the desire to obtain a high water permeation rate, as taught by EP 074952 A1.

For claim 11, EP 074952 A1 clearly shows in Figs. 1-4 that the microfibrils are divided into groups of a plurality of pieces that are bundled together and that the micropores are elliptic.

For claim 12, the Examiner repeats (see first paragraph, page 5, Paper No. 5) that EP 074952 A1 teaches that the membrane is coated by 3 to 30% by weight of hydrophilic polymer (page 3, line 10).

For claims 14 and 15, the Examiner repeats (see section 5, Paper No. 5) that EP 074952 A1 is directed to a composite hollow fiber microporous polyolefin membrane, which inherently encompasses and clearly envisages isotactic polypropylene.

For claim 16, EP 074952 A1 shows in Table 1 that the membrane internal diameter is in the range of 278-458 μm.

(11) Response to Argument

Applicants' argument that "it can be seen from a reading of the examples of EP 074952 A1 that Examples 1, 2 and 4-10 are directed to two-layer hollow fiber membranes and only Example 3 is directed to a three-layer hollow fiber membrane potentially analogous to that of present Claim 1. Further, the three layer hollow fiber membrane of Example 3 of EP 074952 A1 has a porosity of only 64%, which is in fact the lowest porosity disclosed in the table and is far lower than the "overall porosity of not less than 75% by volume" of present Claim 1. Therefore there is no teaching or suggestion in EP 074952 A1 to motivate the worker of ordinary skill in the art arrive at a composite hollow membrane which has three or more layers and an overall porosity of not less than 75% by volume" (Appeal Brief, pages 3-4, bridging paragraph) has been carefully considered in prior Office actions, but is not persuasive. The Examiner notes that EP 074952 A1 teaches that because the prior art teaches that for a membrane with uniform micropores there is an inverse relation between water permeability and separation capability, the invention of EP 074952 A1 is directed to a multilayered membrane to meet both requirements of high water permeability and high separation capability (EP 074952 A1, pages 2-3, bridging paragraph). EP 074952 A1 teaches that

the microporous membrane has a multilayered structure of b-layer to provide a function of reinforcing mechanical strength, and a-layer to provide a separation function (page 3, lines 3-5), and the membrane may have a two-layered structure with b-layer as inner or outer layer, or a three-layered structure with b-layer on both surfaces of a-layer (page 3, lines 39-41). For a-layer, the size of micropores is in the range of 0.1-0.8 mm, preferably 0.3-0.5 mm, and its thickness is in the range of 0.5-20 mm. For b-layer, the size of micropores in is in the range of 0.2-1 mm, preferably 0.4-0.5 mm, and its thickness is greater than 2/3 of the total membrane thickness (page 3, lines 49-55). It is noted that in Table 1, 9 out of 10 examples are two-layered membranes, with the b-layer thickness in the range of 50-78 mm, and overall membrane porosity in the range of 60-76%. Although the only example for a three-layered membrane (Ex.3) shows a low porosity of only 64%, one of ordinary skill in the art would find that the calculated b-layer thickness (assuming a symmetrical structure) of Ex.3 is only of 28 mm, which is clearly much less than the typical b-layer thickness, as shown in the two-layered membrane, and when considering the teachings of EP 074952 A1 as a whole, the particularly thin b-layer of Ex.3, which renders the membrane having a lower porosity, does not appear to be a representative thickness. As such, in view of the fact that the Examiner has also established that EP 074952 A1 anticipates all the structural elements of the instantly claimed invention, such as the three-dimensional net structure, the plurality of the micropores which comprises stacked lamella and micro fibrils with desired length, and layer thickness, etc. (see Paper No. 7, section 5), and also nowhere in EP 074952 A1 there is a teaching that Ex.3 is a limiting example, the Examiner

reasserts that the teachings of EP 074952 A1 clearly encompass the high porosity element of the three-layered structure of the instantly claimed invention, i.e., the high porosity is an obvious optimization to one of ordinary skill in the art of multilayered composite membrane, motivated by the desire to form a three-layered membrane having both high water permeability and high separation by forming a thin a-layer, as separation layer, which is supported on both surfaces with highly porous b-layers, as reinforcing layers, as taught by EP 074952 A1.

Applicants' arguments that "The relationship between the isothermal crystallization time of the resins used for the outermost layer and the innermost layer and the isothermal crystallization time of the resin used for the intermediate dense layer, when satisfied, as in amended Claim 1, produces a composite hollow fiber membrane which shows significant improvement in water permeability and separation accuracy" (Appeal Brief, page 4, bottom paragraph) and "since the ratio depends on both the particular resins used in the layers of the hollow fiber membrane and the manufacturing process of making the composite hollow fiber membrane, and EP 074952 A1 neither teaches nor suggests any isothermal crystallization tome for any of the resins used in the hollow fiber membrane of the reference, there is no motivation to the worker of ordinary skill in the art to arrive at a composite hollow fiber membrane having the ratio of present Claim 1. The Examiner's interpretation of the teachings of EP 074952 A1 is an impermissible hindsight reconstruction of the prior art in light of Applicants' disclosure" (Appeal Brief, page 5, first full paragraph) have also been carefully considered, but are not persuasive. The Examiner repeats (see Paper No. 7, page 4)

that since the method of making the membrane is essentially the same, and the Examiner has established (Paper No. 7, page 3-4) that the micropore size and structures of the instantly claimed invention are anticipated by EP 074952 A1, in the absence of unexpected results, a suitable ratio of the isothermal crystallization time between the membrane layers are believed to be either inherent physical properties of the polyolefins required by the membrane manufacturing process (e.g., annealing is typically carried out isothermally, and note also that EP 074952 A1 does teach at page 4, lines 48-52, that selecting a proper relation of melt index, which is a measure of the mobility of the polymer chains and inherently effects chain mobility dependent isothermal crystallization time, of MIb>MIa is important for forming proper micropores in each layer), or an obvious optimization to one of ordinary skill in the art, motivated by the desire to form suitable size of the lamella crystals and hence the proper size of the micropores in each layer. Additionally, it should be noted that the Examiner has previously pointed out that this is a product-by-process element, and Applicant must show that the resultant article is patentably distinct from those taught by the reference (see Paper No. 7, page 4), however, Applicants fail to provide any evidentiary support that the resultant article is structurally effected by the isothermal crystallization time.

With respect to Applicants' contention that "The three layer composite hollow fiber membranes of Examples 1-5, according to present Claim 1, show superior results in water permeation amounts, which range from 35.5 to 38.6 L/(m^2hrKPa), as compared to 33.4 and 32.1 for Comparative Examples 1 and 2, respectively." (Appeal Brief, page 6), the Examiner notes that clearly Comparative Examples 1 and 2 have lower

porosities than the optimal two-layered membranes of EP 074952 A1, which teaches porosity to up 76%, as such the comparison can hardly be viewed as objective and fair, and the difference in results also appear to be in a close range, i.e., the performance of the instantly claimed invention does not appear to be "superior". Further, it should be noted that there is no three-layered comparative example, made according to the teachings of EP 074952 A1 and with typical layer thickness, presented in Table 2 of present application. Similarly, the results for "Accumulated Amount of Water Permeated Through Continuous Water Permeation Test" appear to be lacking representative examples of comparable three-layered membrane of EP 074952 A1.

With respect to Applicants' argument that "Claim 8 sets forth a specific initial water permeation amount that is neither disclosed nor suggested by either cited reference" (Appeal Brief, page 7, first full paragraph), the Examiner notes that although EP 074952 A1 is silent about the initial water permeation amount, EP does expressly teach that the multilayered membrane is subjected to a process to render a permanent hydrophilic property (page 5, lines 44-45), and the Examiner reiterates (see Paper No. 7, page 5) that EP 074952 A1 teaches that depending on the size of the particles to be separated, the flux value can be up to and not less than 5 liter/(m^2 X hr X mmHg), i.e., greater than 37.5 L/(m^2 X hr X KPa) (page 4, lines 24-33), which is clearly greater than the amount of 25 L/(m^2 X hr X KPa) of Claim 8. As such, a suitable initial high water permeability is believed to be either inherently disclosed by the permanent hydrophilic property of the membrane, or an obvious optimization to one of ordinary skill

in the art of high flux water filtration membrane, motivated by the desire to obtain a high water permeation rate, as taught by EP 074952 A1.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Victor S. Chang
December 15, 2003

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